

BuckyDiagnost Floor System

SYSTEM REFERENCE MANUAL



DMC Hamburg

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Manual Order No. 4512 984 26871 REV AA
4512 98303131

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Transparent plastic sheet

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History record

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1. General Information



Section 2

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Record of default user programs

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Read me first

Read me first

System status report for manufacture and field installation

Introduction:

The Bucky system is adjusted in the factory according to the actual service documentation.

The status report list gives an overview about:

- Traceable items / system configuration.
- Settings and adjustments during the pre-installation in the factory.
- Values and ranges for acceptable deviations.
- For the final handing over to the customer the status report must be completed from the field engineer.

Contents:**1. System configuration for traceable items****2. Programming and adjustments for**

Only the marked text segments are included.

- | | | |
|--------------------------|---|--------------------------|
| <input type="checkbox"/> | BuckyDiagnost CS 2/4, FS and TraumaDiagnost | (4512 983 03191) 3 pages |
| <input type="checkbox"/> | BuckyDiagnost TH2 / TF and DigitalDiagnost TH | (4512 983 03201) 3 pages |
| <input type="checkbox"/> | BuckyDiagnost VE / VT / VR / VE2 / VT2 | (4512 983 03211) 1 page |

3. General / Safety aspects (4512 983 03231) 1 page

NOTE

The requirements listed in this section may differ from the requirements of national regulations (e.g. RÖV).

Measured values outside this status report must be inside the limitation of national regulations. ■



factory
sidefield
side

2. Programming and adjustment

The mechanical installation must be done in order of the installation manual.

For adjusting and programming fill out the attached list.

BuckyDiagnost CS 2/4 , FS and TraumaDiagnost

Generator + BuckyDiagnost CS 2/4

Labelling on the keyboard

☐☐

Generator is programmed

☐☐

This programming must be checked especially for main power condition

U = 400 V R = 100 mΩ

☐

U = V R = mΩ

☐

Generator with tube 1 Type is adapted Serial No.

☐

Generator with tube 2 Type is adapted Serial No.

☐

All functions are in order with the operator manual

☐☐

AMPLIMAT function is tested L C R measuring field

☐

Insert cassette 24 cm x 30 cm (lengthways and vertical format).

All measuring fields (L, C, R) selectable.

Insert cassette 18 cm x 24 cm (lengthways and vertical format).

Only center measuring field selectable.

Emergency switch off by < 600 mAs tested

☐☐

Check of free exposure

Standard APR settings

☐☐

Individual APR settings

☐

Programmings for individual film screen systems

☐

Jumper setting Basic Interface EZ150 :

BuckyDiagnost : Pos. W4-1

☐

DigitalDiagnost : Pos. W4-1

☐

Software programming AMPLIMAT sensitivity

BuckyDiagnost : high

☐

DigitalDiagnost : high

☐

factory
sidefield
side**Collimator + BuckyDiagnost CS 2/4, FS****Type of collimator**Manual ☐Automatic ☐**For your information:**

Manual + Automatic

Power supply for coll. bulb = V (11...12 V) (measured on bulb)

**Coincidence of X-ray field and light field**

Exposure data: SID = 100 cm
 small focus
 kV
 mAs

Test images for sensing ☐light - X-ray ☐

Enclosed this report.

The tolerances in the table are valid for an SID = 100cm.

The tolerances change linearly depending on the SID.

The maximum deviation between light and X-ray is allowed to be as follows at all four edges. (see table)

	automatic	manual
Tol.	+5 / -3 mm	+9 / -3 mm

The maximum deviation at the top/bottom edge and left/right edge is 5 mm.

In case the light field is smaller than the X-ray field, use minus signs.

measured deviations			
Top :	mm	Bottom :	mm
Left :	mm	Right :	mm

factory side	field side
--------------	------------

BuckyDiagnost CS 2/4, FSAll mechanical movements are in order to the internal checklist (factory side). ☐All functions are in order to the operator manual. ☐Lamp functions – breaks – catches – end stops – cabling. ☐The detents must be programmed with X-Scope ☐**BuckyDiagnost CS 2/4:****The sensing function is tested**in longitudinal direction ☐ transversal direction ☐**BuckyDiagnost FS:****The sensing function is tested****Tracking****BuckyDiagnost VE / VT / VR / VE2 / VT2**Function of remote control (light, collimator) during system READY ☐Pick-up band (def. 300 mm) ☐End-position potentiometer ☐**BuckyDiagnost CS 2/4**Current limit during tracking ☐Pick-up band (def. 300 mm) ☐**TraumaDiagnost**

(not implemented)

Order No.:

Customer: Room:

	Technician/Name	Signature	Date
Factory			
Service			

factory
sidefield
side

2. Programming and adjustment

The mechanical installation must be done in order of the installation manual.

For adjusting and programming fill out the attached list.

BuckyDiagnost TH2 / TF and DigitalDiagnost TH

Function in order to the operator manual

☐☐

Programming in X-Scope customer name, room No. and basic settings must be checked and completed

☐

Table height -

standard: Table height measured on

min. = mm (450 ± 5 mm)

cassette surface to ground

☐☐

max. = mm (850 ± 5 mm)

digital : Sensitive layer of the flat detector to ground

☐☐

BuckyDiagnost CS height

(This value is depending on your room height and therefore also adjusted on field side).

min. = mm

☐

max. = mm

From both values the SID is calculated.

For testing this value the real value may differ $\max \pm 2$ cm.

Displayed SID = cm "Real" SID = cm

☐☐

If the deviation is too large the table height and CS height adjustment must be repeated.

Note

Motor current for table up (under max. load) $C = c1 \ 20\mu F + c2 \ 16\mu F$

(50 Hz / 230 V)

$I = A (< 3.5 A)$

without $c2$

$I = A (< 2.5 A)$

Nominal value = 120 ms ± 4 ms

☐

No grid lines visible by exposure time $t \geq 3$ msec.

factory
sidefield
side**Tomo + TH and Tomo 2 + TH2**

Function in order to the operator manual

☐☐

Servo assistance during tomo run o.k.

☐☐

Image quality Tomogram:

Angle	Tomo time in s	Layer height in mm	Layer height deviation \pm 3mm
40°	1.2	45	
40°	1.2	130	
40°	1.2	199	

Image resolution in images enclosed this test report.

With standard test grid (50 μ funk raster)

limiting resolution = 2.32lp/mm with small focus

(spotcheck)

☐

actual resolution = lp/mm

☐

Layer height

Measured deviation by 130 mm layer height (max. deviation is \pm 3 mm)

(spotcheck)

☐

nominal layer height = mm

actual layer height = mm

☐**Note***The layer height is adjustable with "tid" under X-Scope. tid = mm**tid nominal = 65 mm**Range of adjustment = 65 ... 75 mm**tid ACL nominal = 70 mm**Range of adjustment = 70 ... 80 mm**tid flat detector = 78 mm**Range of adjustment = 70 ... 90 mm*☐

factory
side

field
side

Extent of the X-ray beam

(spotcheck)

☐
☐

The extent of the X-ray beam with Tomo is tested by

layer height = 130 mm SID = 115 cm Tomo angle = 40° 1,2 sec = Exposure time

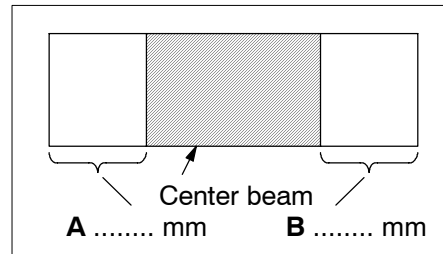
$$|A| - |B| = \leq 6 \text{ mm}$$

A = mm

B = mm

Maximum extent of the X-ray beam

$$|A| + |B| = \leq 40 \text{ mm}$$



Symmetry

(spotcheck)

☐
☐

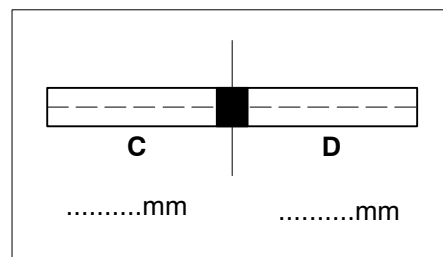
The symmetry of the X-ray beam with Tomo is tested by

layer height = 130 mm SID = 115 cm Tomo angle = 40° 1,2 sec = Exposure time

$$|C| - |D| = \leq 5 \text{ mm}$$

C = mm

D = mm



Order No.:

Customer: Room:

	Technician/Name	Signature	Date
Factory			
Service			

factory
sidefield
side

2. Programming and adjustment

The mechanical installation must be done in order of the installation manual.

For adjusting and programming fill out the attached list.

BuckyDiagnost VE / VT / VR / VE2 / VT2

AMPLIMAT function

☐

All mechanical movements and functions are in order to the operator manual.

☐

Nominal value = 120 ms \pm 4ms

☐

No grid lines visible by exposure time $t \geq 3$ msec.

Order No.:

Customer: Room:

	Technician/Name	Signature	Date
Factory			
Service			

factory
sidefield
side**3. General / Safety aspects****System configuration:**Generator OPTIMUS 50 ☐ 65 ☐ 80 ☐

Room 1

Room 2

Room 3

Emergency switch off is checked

☐

Fault current switch tested

☐Connected earth cable and check the bucky/digital DIAGNOST TH, bucky wall stand (BWS), CS..
and measure the earth resistance test ☐☐The earth resistance (as measured above) must always be < 100 mΩ
(central point = generator)☐

All end stops are installed, specially on the CS rails

☐**Functional test of collisions switches**☐

Unit	Down	Up	Remarks
TH table	≤ 200 N		completely assembled including table top and covers
CS	≤ 100 N		weight compensation performed
Motor VE / VT	70 N ± 10 N	70 N ± 10 N	completely assembled and weight compensation performed

Note*Do not adjust the TH table collision switch SSI10 (factory calibrated).*

CS covers are fixed

☐

Exception test according RÖV / VA / DOD or other national regulations

☐

Order No.:

Customer: Room:

	Technician/Name	Signature	Date
Factory			
Service			

LIST OF PAGES AND MODULES

MODULE CODE NUMBER: 4512-983-04441

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Collimator Compliance Test

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1. Introduction

NOTE

This test must be done after assembly and after each collimator or X-ray source exchange, to be in compliance with IEC 60601-1-3 and 21CFR 1020. This test is mandatory for the USA and Canada. If measurements show values outside of acceptable tolerances (see Workbook 5), check the mechanical adjustments and repeat measurements. If the stated tolerances are exceeded, then the system is not in compliance with IEC 60601-1-3 and FDA regulations and must not be operated.

Test Equipment / Tools

Cassette (18x 24 cm)
Cassette (24 x 30 cm)
Cassette (35 x 43 cm)
Cassette (35 x 35 cm)
Ruler, metric / inch
Metal washer
10 foot measuring tape
4 copper strips

2. Test 1: Alignment of BLD Light Field and X-Ray Field (Radiographic)

NOTE

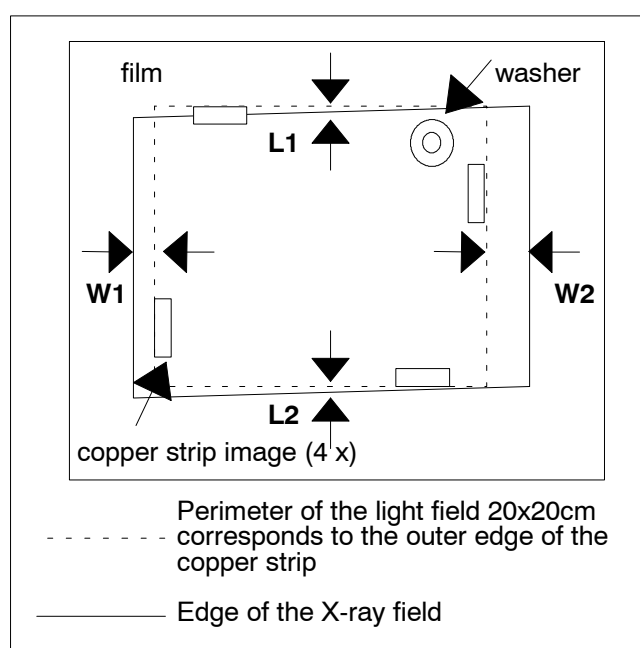
This test is to determine that the X-ray field size and location is identical to the BLD light field for large and small focus!

Setup

1. Place the loaded 10 x 12" (24 x 30 cm) cassette on the table top and center the overtable tube directly at a SID of 40" (100 cm).
2. Place empty 8 x 10" (18 x 24 cm) cassette in the bucky unit to enable exposure.

Test

1. Turn on the BLD light.
2. Define the light field perimeter by placing outer edges of copper strips at the four light field sides (refer to figure).
3. Place washer in one quadrant of the film at the anode end to identify positioning after development.
4. Select large focus and overtable tube at control desk and expose at 60 kV, 5 mAs.
5. Develop the film.
6. Measure the distances L1, L2, W1 and W2 between outside edges of copper strips and the edges of the X-ray field as shown.
7. Repeat the test for small focus.



Result

Record all measurements and file in the workbook. The measurements must comply with the rejection limits. Number and date the films and file them with the workbook.

Specification

The total misalignment of the edges of the BLD light field with the respective edges of the X-ray field along either the width or length of the light field shall not exceed 2 % of the SID.

SID = 40" (100 cm); 2.0 % x 40" (100 cm) = 0.80" (2 cm)	
Large focus	$L1 + L2 = \underline{\quad} + \underline{\quad} = \leq 2.0 \% \text{ SID}$ $W1 + W2 = \underline{\quad} + \underline{\quad} = \leq 2.0 \% \text{ SID}$
Small focus	$L1 + L2 = \underline{\quad} + \underline{\quad} = \leq 2.0 \% \text{ SID}$ $W1 + W2 = \underline{\quad} + \underline{\quad} = \leq 2.0 \% \text{ SID}$

Initials	Date

3. Test 2: X-Ray Field Center Alignment (Overtable Tube)

NOTE

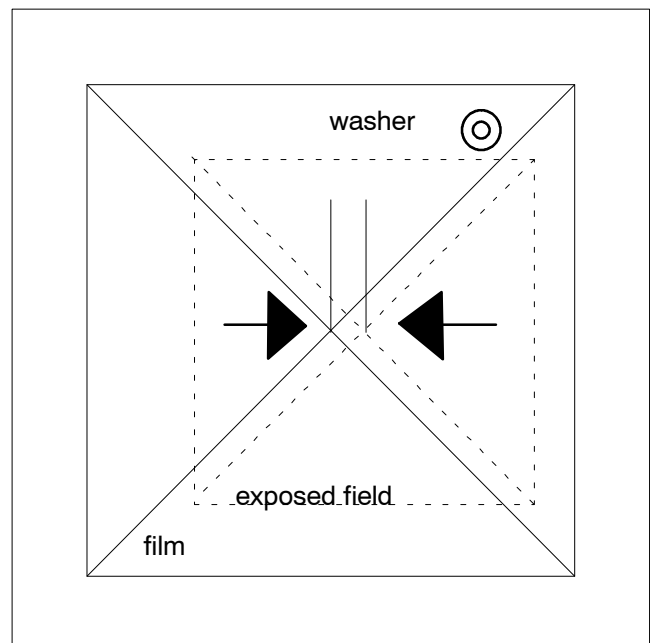
This test must be performed for all tables / bucky stations as well as bucky wallstands, cassette stands etc.!

Setup

Equipment completely assembled.

Test

1. Select the tube and image receptor station on the control desk.
2. Center the tube to the image receptor by using the available centering aids (the centering stops on the ceiling rails, the centering light in the tube control handle bar etc.). Set tube at max. SID: 40" (100 cm) for bucky table, up to 72" (180 cm) for bucky wallstand.
3. Tape the metal washer in one quadrant of the cassette at the anode end for film orientation.
4. Place the loaded cassette (10 x 12 ") or (24 x 30 cm) in the bucky tray and ensure that it is properly centered before the tray is inserted into the bucky unit.
5. Manually set the BLD to a slightly smaller size (approx. 9 x 11") than the cassette size so that the radiated area will be within the limits of the X-ray film.
6. Make an exposure at 60 kV, 5 mAs.
7. Develop the film.
8. On the developed film, locate two points on each of the four sides of the exposed field as it is shown in the figure below.
9. Draw straight lines through two points on each side. Extend the lines until they intersect. The resulting rectangle will be a close approximation of the X-ray field.
10. Draw diagonals across this field. The crossing point of the diagonals is the X-ray field center. Also draw diagonals across the X-ray film. The crossing point is the X-ray film center.
11. Measure the distance between both centers. This is the displacement (misalignment) of the X-ray field in relation to the image receptor.



Results

Record the displacement and file in the workbook. Write the test number and date on the film and file it with the workbook. The test result must be within the rejection limit.

Specification

The displacement between the X-ray film center and the X-ray field center must be $\leq 2.0\%$ SID.

SID = 100 cm; maximum displacement = 20 mm

SID = 180 cm; maximum displacement = 36 mm.

NOTE

This test must be performed for all tables / bucky stations as well as bucky wallstands, cassette stands etc.! If a tube can be used at two different SIDs with the same image receptor, test for both SIDs (tracking).

Measured displacement (mm)	
Maximum displacement for SID = 100 cm = 20 mm	
Maximum displacement for SID = 180 cm = 36 mm	
bucky table	bucky wallstand
_____ mm	_____ mm
_____ mm	_____ mm

Initials	Date

4. Test 3: X-Ray Field Limitation and PBL Operating Range

NOTE

This test must be performed for all overtable tube / bucky stations as well as bucky wallstands, cassette stands etc.! Stands that are used at two different SIDs must be tested at both distances.

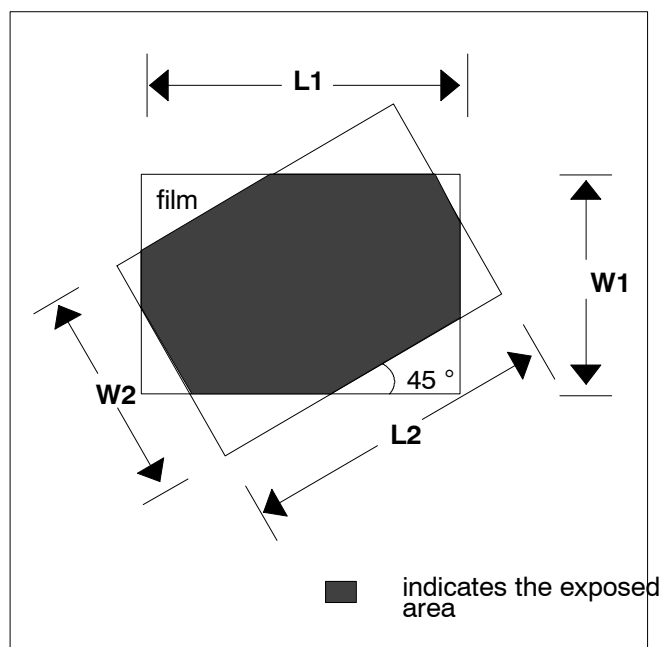
Setup

Equipment completely assembled.

Test

TABLE BUCKY (Field Limitation Test / Indicated Field Test)

1. Select table bucky auxiliary at the generator control desk.
2. Set SID to 100 cm. Center the X-ray tube over table bucky.
3. Rotate the collimator to 45 °.
4. Insert the loaded 18 x 24 cm cassette in the bucky tray.
5. Record the indicated field size from collimator dials below.
Length = _____ Width = _____
6. Make an exposure at 60 kV, 5 mAs.
7. Remove the cassette and put it to a radiation safe place.
8. Repeat steps 4 and 6 using a loaded 35 x 43 cm cassette.
9. Develop both films.
10. Referring to the figure, measure the actual length and width of both films (L1 and W1). Measure the length and width of the exposed area of both films (L2 and W2).



Results

Record all measurements and file in the workbook. Verify that the results are within the specifications. Write the test number and date on the film and file it with the workbook.

Test

BUCKY WALLSTAND (Field Limitation Test)

1. Select bucky wallstand at the generator control desk.
2. Center the X-ray tube to the bucky wallstand and set the SID to 180 cm (72").
3. Rotate the collimator to 45 °.
4. Insert the loaded 18 x 24 cm cassette in the bucky tray.
5. Make an exposure at 60 kV, 5 mAs.
6. Remove the cassette and put it to a radiation safe place.
7. Repeat steps 4 and 6 using a loaded 35 x 43 cm cassette.
8. Develop both films.
9. Referring to the figure on the next page, measure the actual length and width of both films (L1 and W1). Measure the length and width of the exposed area of both films (L2 and W2).

Results

Record all measurements and file in the workbook. Verify that the results are within the specifications. Write the test number and date on the film and file it with the workbook.

Specifications

1. The total misalignment of the edges of the X-ray field with the respective edges of the selected portion of the image receptor along the length or width dimensions of the X-ray field in the plane of the image receptor shall not exceed 3 % of the SID.
2. The sum, without regard to the sign, of the above length and width misalignments shall not exceed 4 % of the SID.
3. The indicated field size and actual field size must be within 2 % of the maximum SID.
4. For BLDs with PBL and manufactured after November 30, 1983:
Positive Beam Limiting must be operational when:
 - a X-ray beam is within ± 3 % of vertical and
. SID is 90 cm to 130 cm, inclusive.
 - b X-ray beam is within ± 3 % of horizontal and
. SID is 90 cm to 205 cm, inclusive.

NOTE

This test must be performed for all overtable tube / bucky stations as well as bucky wallstands, cassette stands etc.! Stands that are used at two different SIDs must be tested at both distances.

BUCKY TABLE:

Indicated Field Size (Value read off of the collimator)		
	18 x 24 cm cassette	35 x 43 cm cassette
Indicated Width		
Indicated Length		

18 x 24 cm cassette bucky table			
Film (Actual Length and Width)	Exposed	Difference	Specification 100 cm SID
L1 = _____ cm	L2 = _____ cm	L1 - L2 = _____ cm	≤ 3 cm
W1 = _____ cm	W2 = _____ cm	W1 - W2 = _____ cm	≤ 3 cm
		Total difference = (sum of above) _____ cm	≤ 4 cm

Indicated	Exposed	Difference	Specification 100 cm SID
(L step 5) _____ cm	(L2 above) _____ cm	(Ind - Exp) _____ cm	≤ 2 cm
(W step 5) _____ cm	(W2 above) _____ cm	(Ind - Exp) _____ cm	≤ 2 cm

BUCKY TABLE (continued):

35 x 43 cm cassette bucky table			
Film (Actual Length and Width)	Exposed	Difference	Specification 100 cm SID
L1 = _____ cm	L2 = _____ cm	L1 - L2 = _____ cm	≤ 3 cm
W1 = _____ cm	W2 = _____ cm	W1 - W2 = _____ cm	≤ 3 cm
		Total difference = (sum of above) _____ cm	≤ 4 cm

Indicated	Exposed	Difference	Specification 100 cm SID
(L step 5) _____ cm	(L2 above) _____ cm	(Ind - Exp) _____ cm	≤ 2 cm
(W step 5) _____ cm	(W2 above) _____ cm	(Ind - Exp) _____ cm	≤ 2 cm

Initials	Date

Verify with a check (X) (not for manual collimator)	
X-ray beam direction within 3 % of vertical	
PBL operational from 90...130 cm SID	

Initials	Date

BUCKY WALLSTAND (BWS):

18 x 35 cm cassette bucky wallstand			
Film (Actual Length and Width)	Exposed	Difference	Specification 100 cm SID
L1 = _____ cm	L2 = _____ cm	L1 - L2 = _____ cm	≤ 5.4cm
W1 = _____ cm	W2 = _____ cm	W1 - W2 = _____ cm	≤ 5.4 cm
		Total difference = (sum of above) _____ cm	≤ 7.2 cm

35 x 43 cm cassette bucky wallstand			
Film (Actual Length and Width)	Exposed	Difference	Specification 100 cm SID
L1 = _____ cm	L2 = _____ cm	L1 - L2 = _____ cm	≤ 5.4cm
W1 = _____ cm	W2 = _____ cm	W1 - W2 = _____ cm	≤ 5.4 cm
		Total difference = (sum of above) _____ cm	≤ 7.2 cm

Initials	Date

Verify with a check (X) (not for manual collimator)	
X-ray beam direction within 3 % of vertical	
PBL operational from 90...205 cm SID	

Initials	Date

5. Workbook Collimator

General

Customer:

Customers address:

Equipment address:

Distributor:

Installation date:

Report date:

Name of service engineer:

Signature of the service engineer:

Equipment

Component	Description	Type Number	Serial Number
Collimator	<input type="checkbox"/> GALILEO	9896 010 0061_	
	<input type="checkbox"/> NICOL	9896 010 2200_	
	<input type="checkbox"/> Manual Collimator	9890 010 804_ _	
Bucky table			
Bucky wallstand			



Section 6

Service information

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1.



Section 7

Software release bulletins

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1.



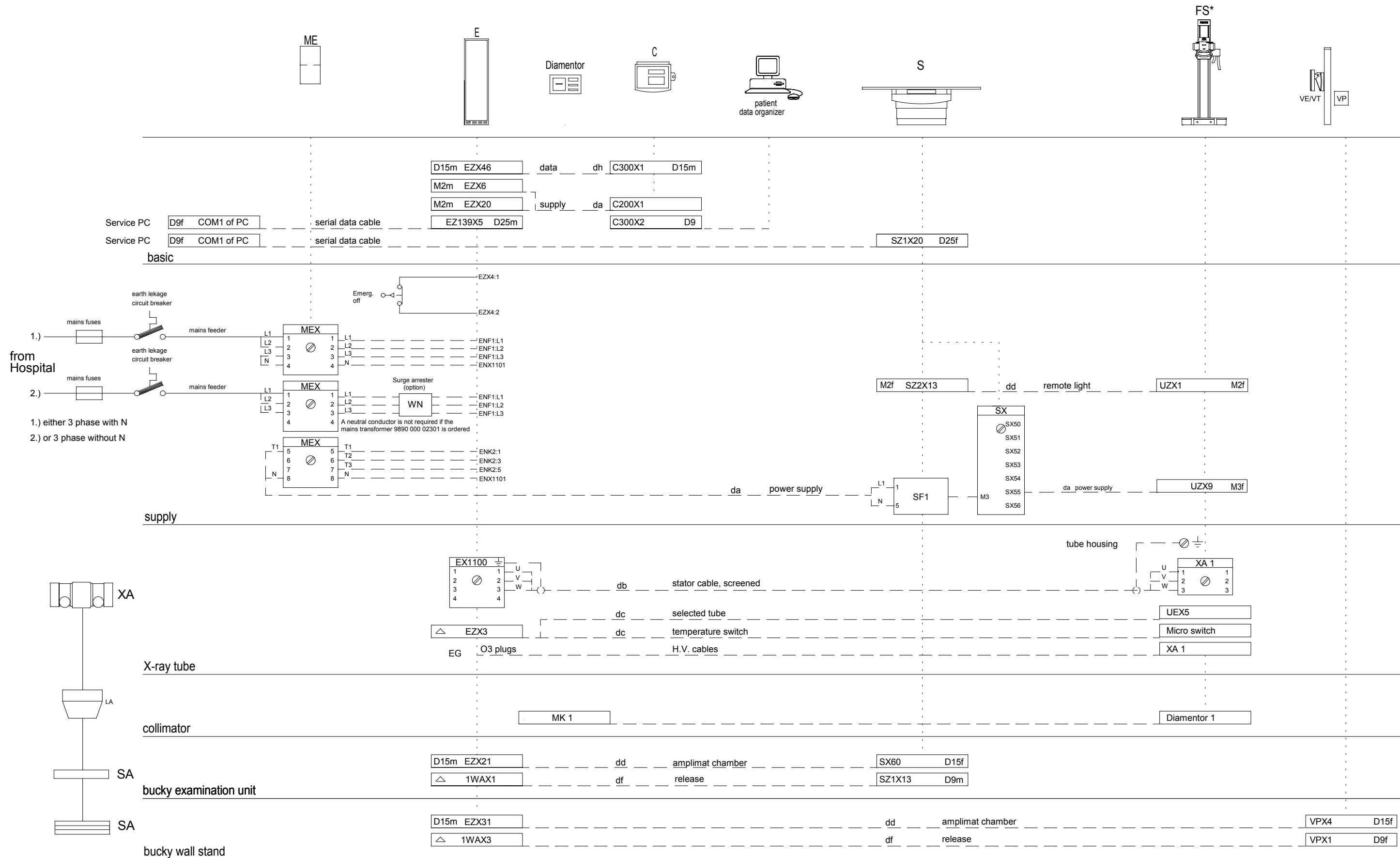
Section 9

Cable and earth diagrams

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1. Connection diagrams

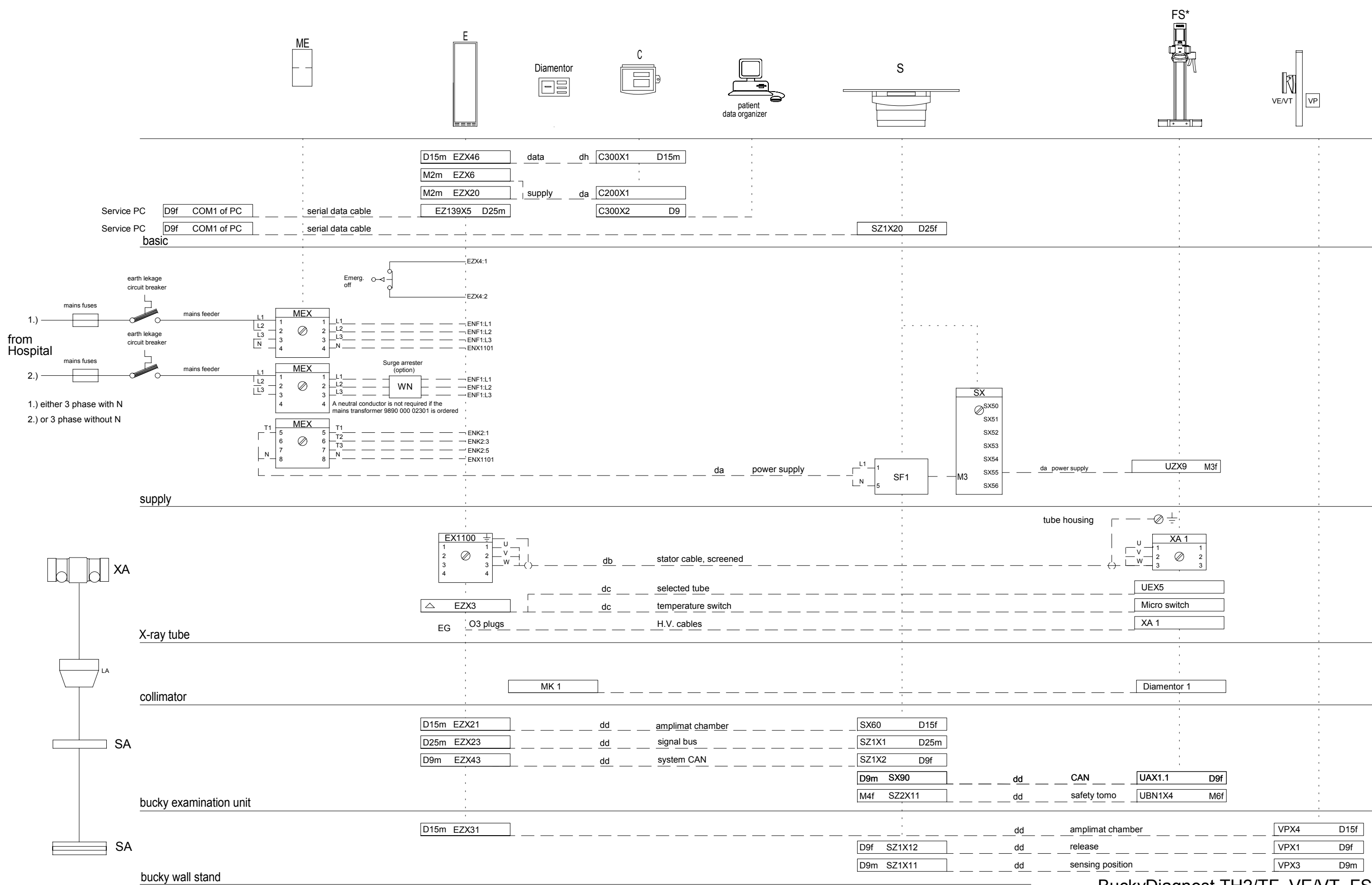




* FS Standard, FS Compact

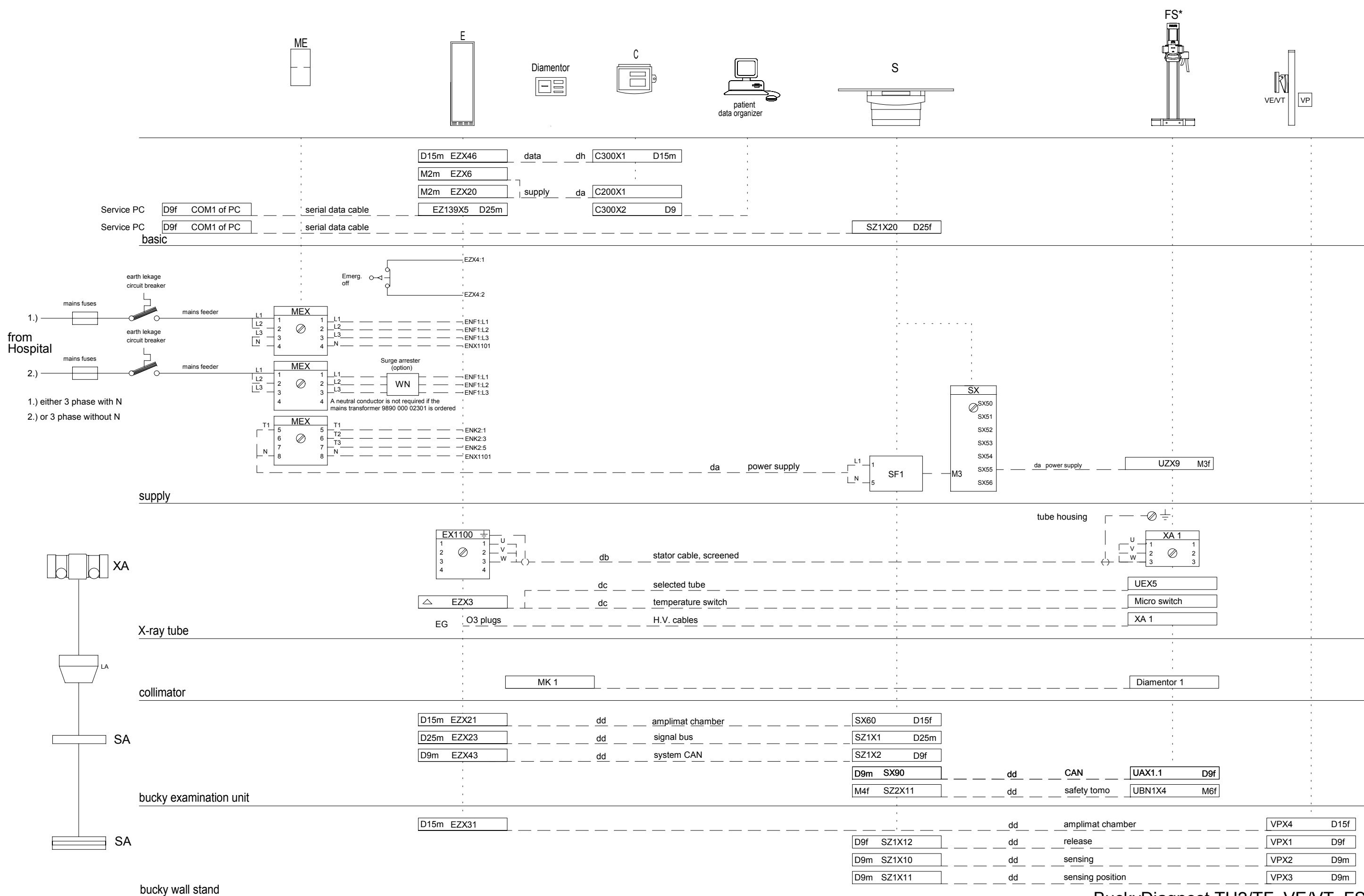
BuckyDiagnost TH2/TF, VE/VT, FS

OPTIMUS RAD
Connection diagram



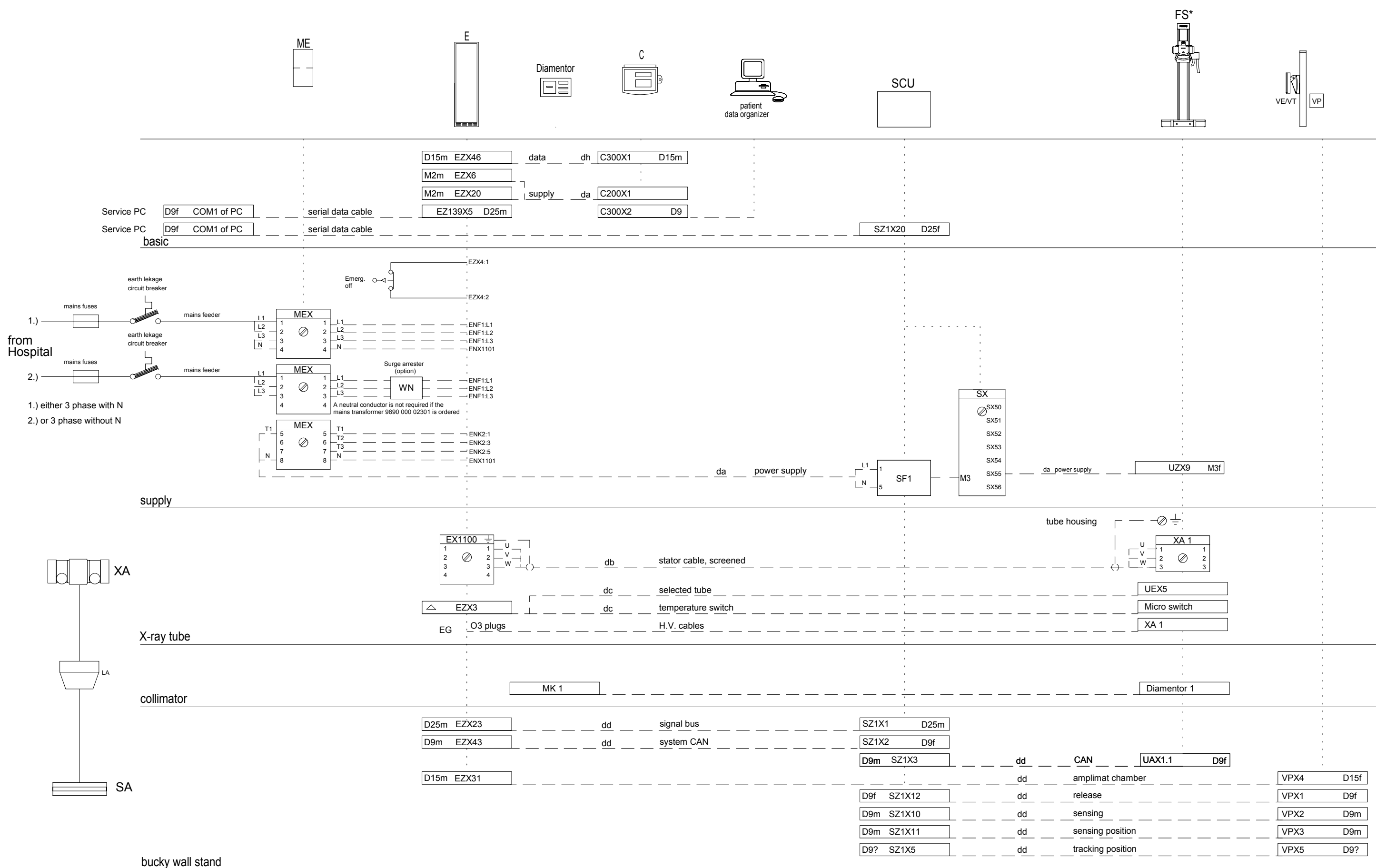
* FS Standard, FS Compact, FS Fix

BuckyDiagnost TH2/TF, VE/VT, FS (with tomography) OPTIMUS RAD Connection diagram



* FS Standard, FS Compact, FS Fix

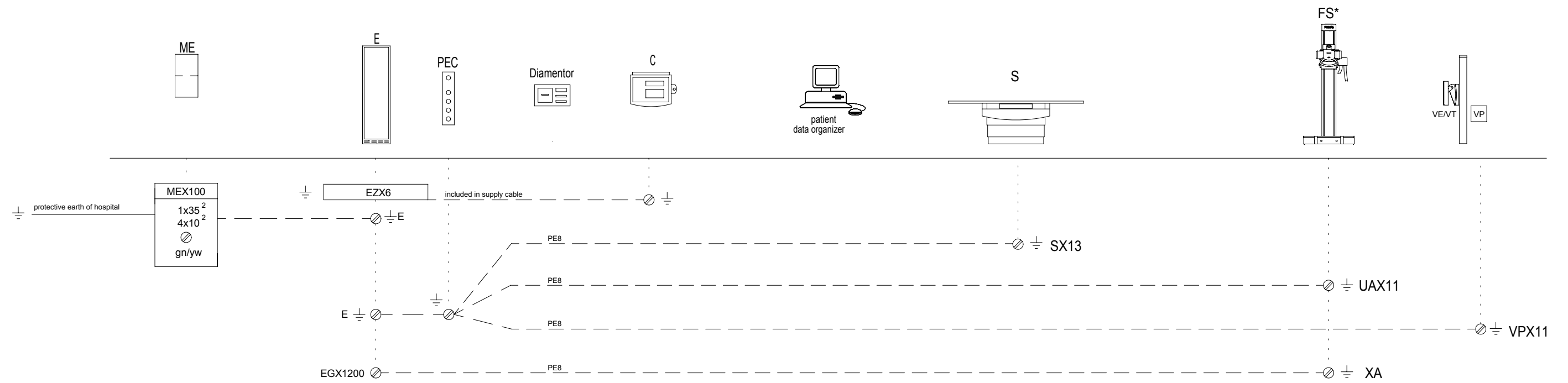
BuckyDiagnost TH2/TF, VE/VT, FS
(with tomography, sensing)
OPTIMUS RAD
Connection diagram



* FS Fix

BuckyDiagnost VE2/VT2, FS
(with sensing, tracking, ACL4)
OPTIMUS RAD

Connection diagram

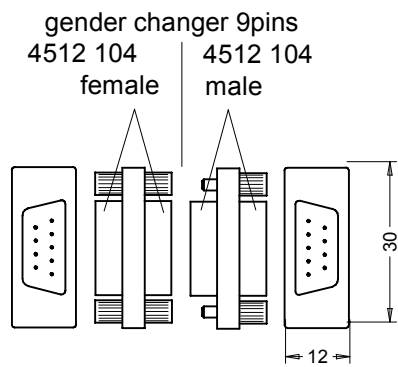


BuckyDiagnost TH2/TF, VE/VT or VE2/VT2, FS
OPTIMUS RAD
Earthing diagram

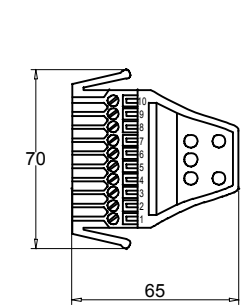
Heading symbols

C	control desk
E	cabinet generator
FS	ucky DIAGNOST Floor Stand
LA	collimator
MEX	wcb generator
S	ucky table for bucky DIAGNOST TH, Segment control unit for bucky DIAGNOST VR or Stand of duo DIAGNOST/easy DIAGNOST
SA	film plane
UA	column (bucky DIAGNOST Floor Stand)
UB	ceiling crane longitudinal carriage (bucky DIAGNOST CS)
UZ	ceiling crane transverse carriage (bucky DIAGNOST CS)
VE/VT	vertical DIAGNOST
VP	wcb vertical DIAGNOST
WS	wallstand
XA	X-ray tube
wcb	wall connection box

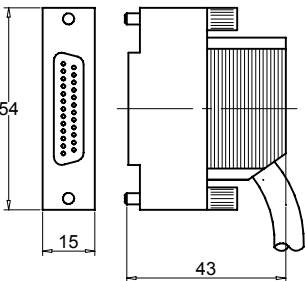
Connectors



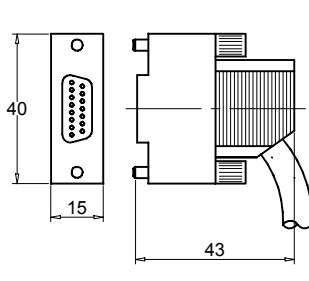
top decade plug
4512 104 0235.



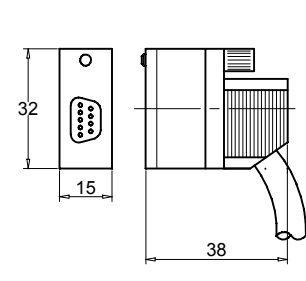
D-SUB 25 pins
2422 025 05039
male



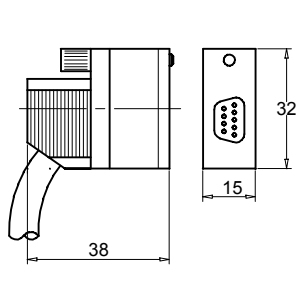
D-SUB 15 pins
2422 025 05038
male



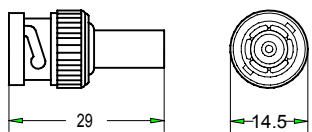
D-SUB 9 pins
2422 025 05456
male



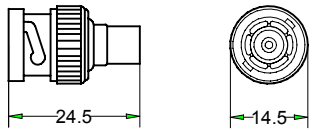
D-SUB 9 pins
2422 034 18334
female



11BNC-connector
2432 020 00272



11BNC-connector
2432 020 00273
2432 020 00369



crimp pin male 2422 034 11636
crimp pin female 2422 034 11632
distance piece (M3, 11mm) 2422 034 20331

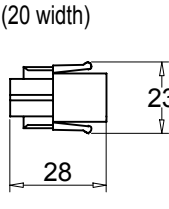
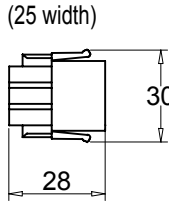
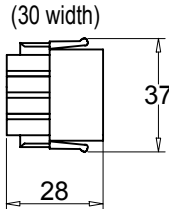
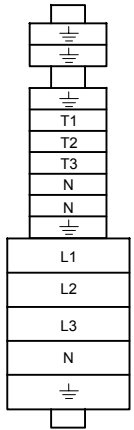
connection block incl.
wall connection box
4512 103 75384

MATE-N_LOCK 12 pins
2422 025 02908
3x4 male

MATE-N_LOCK 3 pins
2422 025 02991
1x3 male

MATE-N_LOCK 6 pins
2422 034 16253
3x2 male

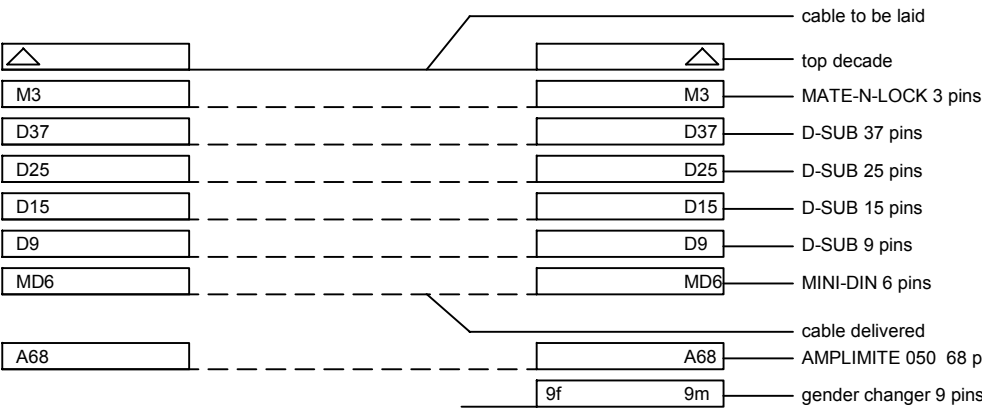
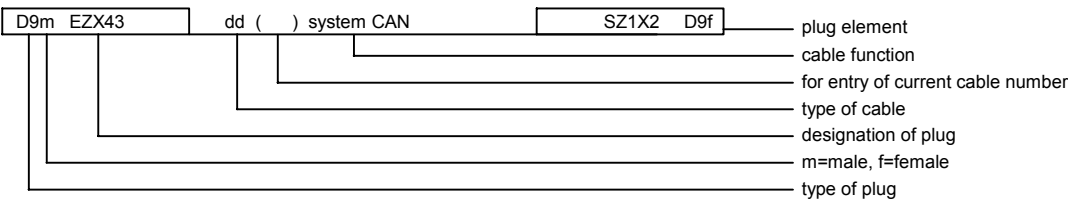
MATE-N_LOCK 9 pins
2422 034 16589
3x3 male



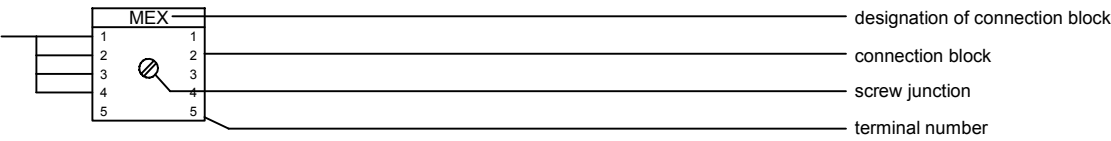
crimp pin female
2422 015 14048

crimp pin male
2422 034 17788

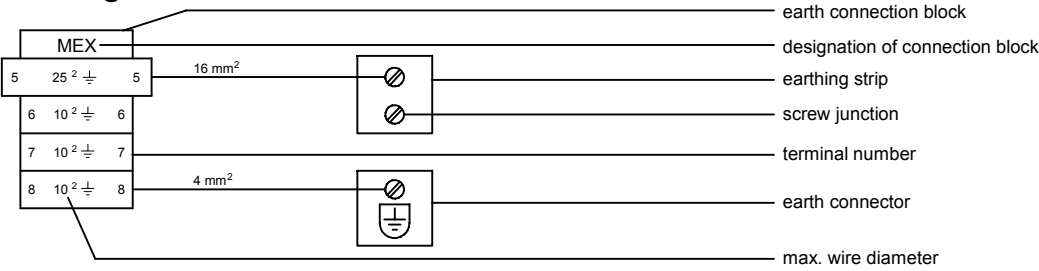
Cable (text) symbols



Connection blocks



Earthing



PE protective earthing yellow/green wire
FE functional earthing red wire
AE antiinterference earthing

Cables

Type	Description	Diameter	Codenummer
da	3+1 x 1.38 mm ²	8.0 mm	0722 207 03044
db	3 x 1.3 mm ² screened + yl	9.2 mm	0722 215 02054
dc	2 x 0.8 mm ²	6.2 mm	0722 300 01011
dd	5x2 x 0.22 mm ² screened	7.4 mm	0722 215 62001
de	12x2 x 0.22 mm ² screened	9.6 mm	0722 215 51007
df	10 x 0.5 mm ²	7.3 mm	4512 100 66451
dg	10 x 0.5 mm ² screened	7.8 mm	0722 997 07248
dh	8x2 x 0.22 mm ² screened + yl	8.4 mm	0722 215 33008
dk	8 x 0.75 mm ² screened	9.6 mm	
dm	6x2 x 0.75 mm ² screened	12.6 mm	
dn	2x2 x 0.22mm ² screened com.chan.	5.6 mm	0722 215 29006
do	2x35 mm ²	40.0 mm	xxxx xxx xxxxx
PE16	16.7 mm ²	9.3 mm	4512 100 66131
PE8	8.25 mm ²	6.82 mm	0722 186 005..
H.V.	O3-O3, 150 kV	16.5 mm	9806 402 6xx02
FOL	fibre optic link	2.9 mm	xxxx xxx xxxxx (xx = length in m)

Legend for cabling diagram

Section 10

Packing list

Contents

1.



Section 11

Films

Contents

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